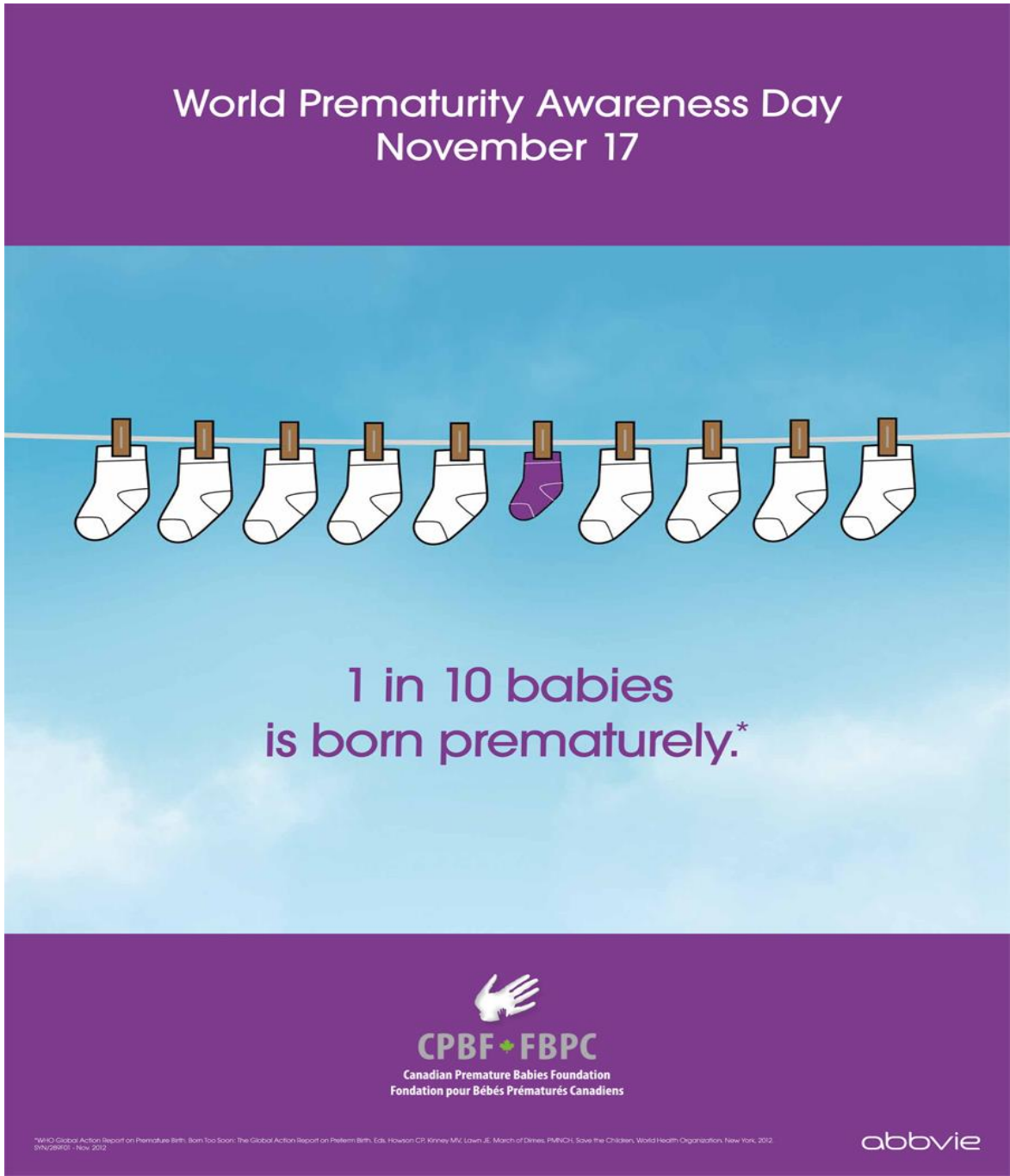
Premature baby

Department of pediatrics

Definition

- A premature infant is a baby born before 37 completed weeks of gestation (by calculating after first day of last menstruation).

- Preterm infant / Preemie/



Children with low birth weight

- There are newborns v
  2500 g

Children with very low birth weight

Are infants weighing less than 1500g to 1000 g

Children with extremely low birth weight

There are newborns weighing less than 1000 g

Clasification

1. insignificant premature (37-35 weeks)

2. moderately preterm (34-32 weeks)

3. severely premature (under 32 weeks)

Risk factors of premature infants born with low birth weight

- Risk factors of social and family environment:
- parents illnesses
- parents gene pool
- low social level
- relations of consanguinity
- chronically ill of their parents
- parents' addictions (alcohol, tobacco, coffee, etc.)
- chromosomal diseases

Risk factors associated with maternal reasons

- Number of pregnancy, infertility , sponataneous abortion in maternal history
- Weight gain 0.9 kg less than every 4 weeks, or total weight < 50 kg
- Growth of uterus less than 4 cm in accordance with gestational age
- Hypertension >140/90 mmHg, edemas, eclampsia
-Decompensated somatic diseases, anemia, mental stress during pregnancy
- History of preterm birth and IUGR children
- Hormonal dysfunctions- diabetes mellitus, hyperthyroidism
- Malnutrition during pregnancy
- Uterine irritability, cervical incompetence or uterine malformation
-Vaginal bleeding- placenta abruption
- Maternal infections (chorioamnionitis)
- Venereal disease during pregnancy increases the risk of abortion

Preterm delivery for fetal reasons

- - Abnormal presentations
  - Genetic factors
  - Growth failure
  - Chromosomal diseases
  - Fetal anomalies
  - Early rupture of the amniotic sac
  -Multiple gestation
  - Severe oligohydramnitis

Risk factors linked to the placenta:

- - Morphological abnormalities
  - Hypoplasia, detachment of the placenta
  - Small placenta with calcification, placental abrubtion
  - Anatomical signs (take-stroke, single arteries, prolapse of the umbilical cord, the umbilical vein thrombosis)
  - Utero-placental insufficiency

Morphological signs of prematuri

- -Head consists 1/3 from all body. parietal bones are thin ,the neck looks longer.
- -Skin is red, very thin, gelatinous consistence
- -Lanugo on the back side ,rams, face and rarely on legs.
- -Ears are very soft.
- -Chest is longer and thin.
- -Abdomen is bigger, umbilical cord is thin, located lower
- -External genital organs are not formed completely(testes are not in the scrotum)

Functional signs of prematurity

- Passive movements, voice is very tender, they have the feeling that they need to sleep always.
- Muscular tonus is low, reflexes can be absent.
- Breathing –abdominal type, irregular, with gasping)
- Breathing consists 48-52 beats per minute , in the extremely preterm baby= 36-82 beats per minute
- Blood pressure is less then at full-term newborn = 45/20 in first 10 days after birth it can rise to 85/40mm Hg. Heart rate 120 -160 beats per minute . In hypothermia or other perinatal pathology there occurs bradycardias (heart rate less then 60 per minute)

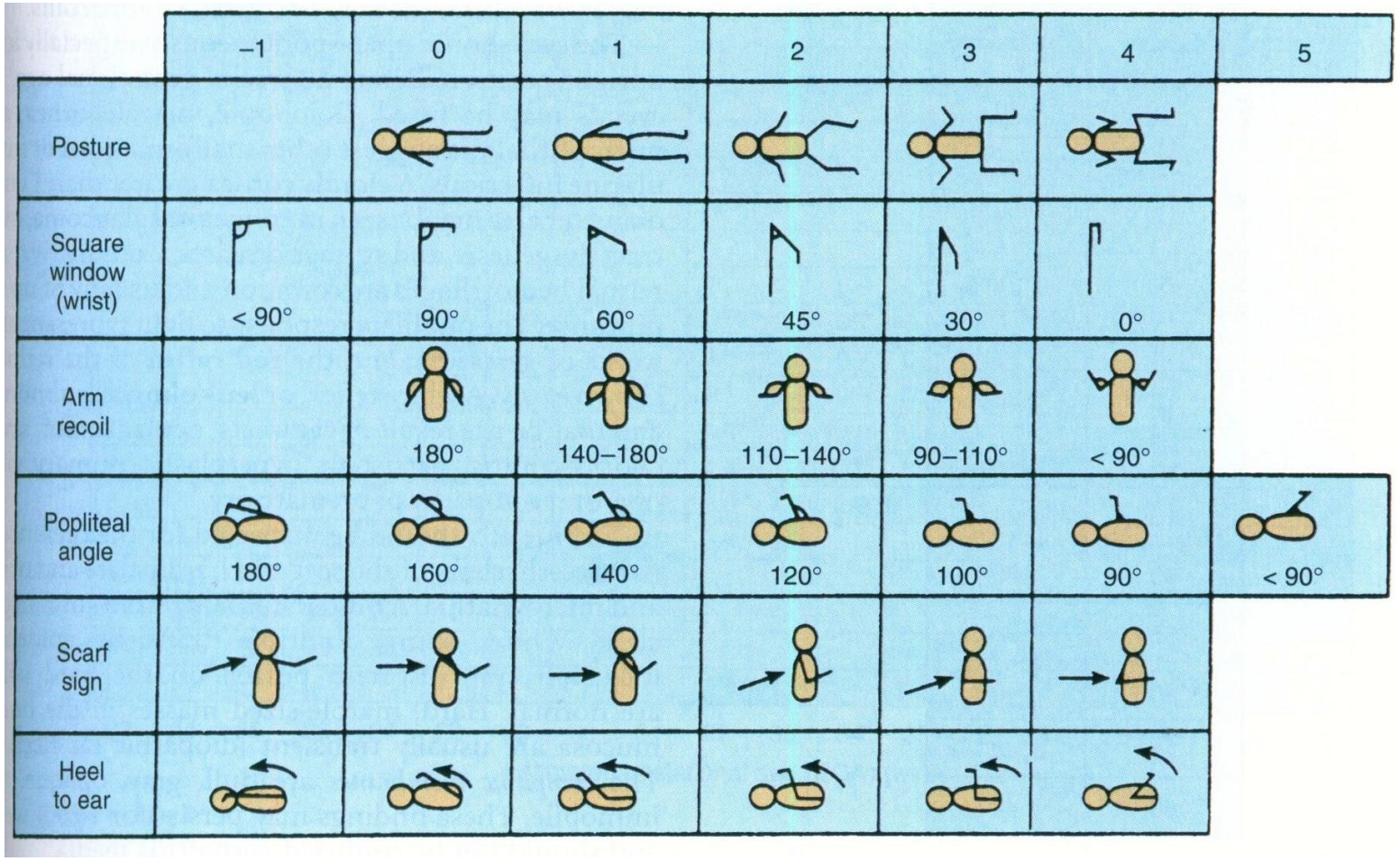
Functional signs of prematurity

- Immature hypothalamus
- Digestive system –quantity of gastric juice is 3 times less then of a term newborn. Enzyme activity of intestinal juice is low, but enzyme activity of gastric juice is normal.
- Intestinal and abdominal hypotony.
- Renal function-low glomerular filtration, renal blood flow 1-3 ml/kg, diuresis is low, urea, Cl, Na, K ,P clearance is low.
- They can lose more then 10% from birth weight and they need more time for gain weight.
- Premature baby has a vertical position of stomach, this causes frequent regurgitations.

Assess size for gestational age

- Plotting weight, height, head circumference against gestational age using a standardized neonatal growth chart.
- Assess neuromuscular and physical maturity using Ballard Score

Assessment of gestational age Ballard Score- neuromuscular maturity



Maturity rating score	weeks
5	26
10	28
15	30
20	32
25	34
30	36
35	38
40	40
45	42
50	44

Ballard Score – physical maturity

Physical maturity	–1	0	1	2	3	4	5
Skin	Sticky, friable, transparent	Gelatinous, red, translucent	Smooth, pink, visible veins	Superficial peeling or rash, few veins	Cracking, pale areas, rare veins	Parchment, deep cracking, no vessels	Leathery, cracked, wrinkled
Lanugo	None	Sparse	Abundant	Thinning	Bald areas	Mostly bald	
Plantar surface	Heel–toe 40-50 mm: –1 Less than 40 mm: –2	<50 mm, no crease	Faint red marks	Anterior transverse crease only	Creases on anterior 2/3	Creases over entire sole	
Breast	Imperceptible	Barely perceptible	Flat areola– no bud	Stripped areola, 1-2 mm bud	Raised areola, 3-4 mm bud	Full areola, 5-10 mm bud	
Eye/ear	Lids fused, loosely (–1), tightly (–2)	Lids open, pinna flat, stays folded	Slightly curved pinna; soft, slow recoil	Well-curved pinna, soft but ready recoil	Formed and firm; instant recoil	Thick cartilage, ear stiff	
Genitals male	Scrotum flat, smooth	Scrotum empty, faint rugae	Testes in upper canal, rare rugae	Testes descending, few rugae	Testes down, good rugae	Testes pendulous, deep rugae	
Genitals female	Clitoris prominent, labia flat	Prominent clitoris, small labia minora	Prominent clitoris, enlarging minora	Majora and minora equally prominent	Majora large, minora small	Majora cover clitoris and minora	

The most common complications in preterm baby (1)

- Perinatal asphyxia
- Hypothermia
- Respiratory disorders (respiratory distress syndrome)
- Cardiovascular disorders (hypotension, open ductus arteriosus)
- Neurologic intraventricular hemorrhage (HIVE), periventricular leukomalacia
- Gastrointestinal: paralytic ileus, necrotizing enterocolitis
- Hypoglycemia and hyperglycemia
- Indirect (unconjugated) and direct (conjugated) hyperbilirubinemia

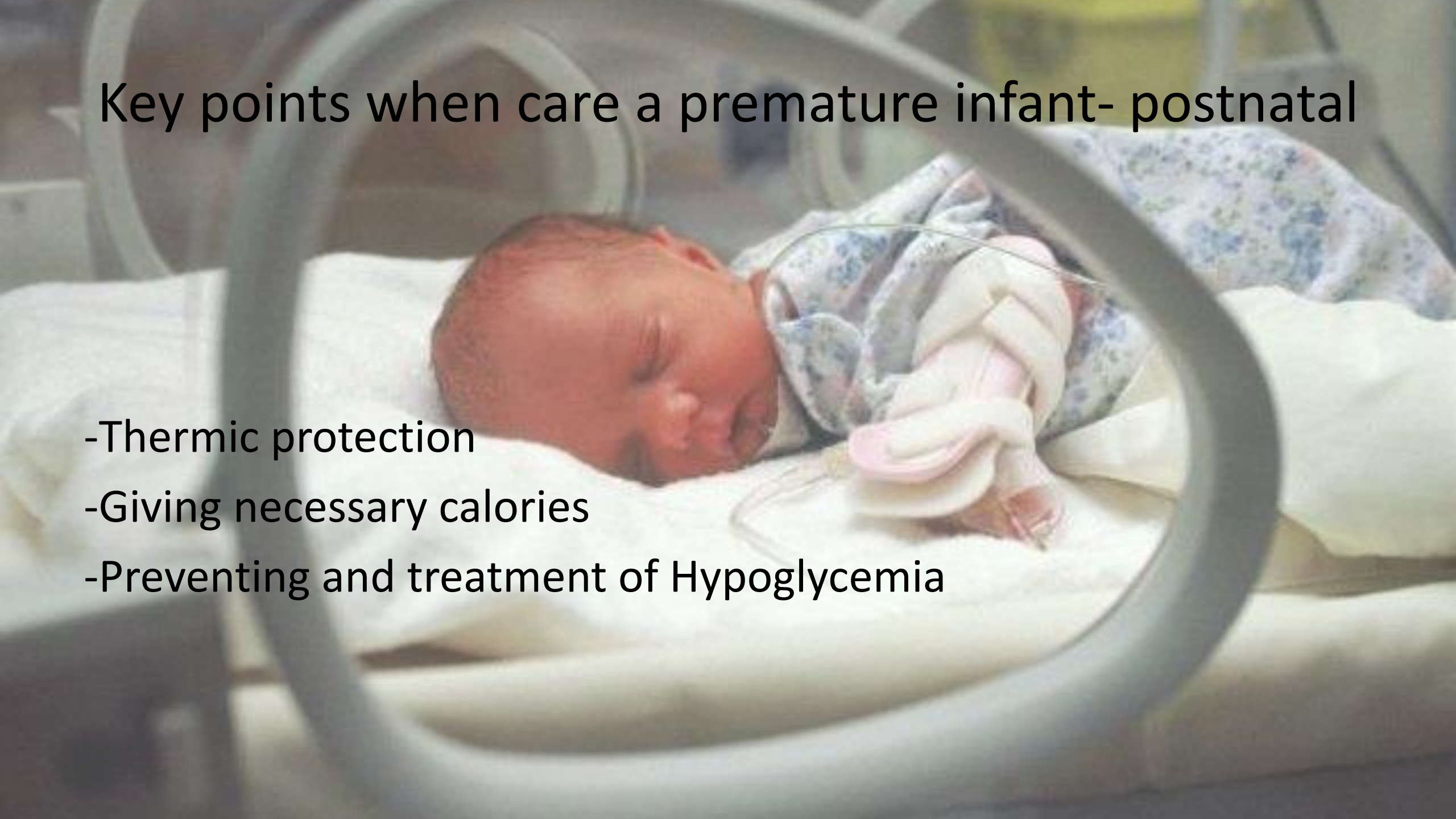
The most common complications in preterm baby (2)

- - Hypoprothrombinemia
  - Fluid and electrolyte balance disorders (hyponatremia, hyperkalemia, metabolic acidosis)
  - Anemia
  - Neonatal sepsis
  - After therapy O2: retinopathy of prematurity (ROP) and chronic lung disease
  - Neuro-developmental disorders
  - Psychosocial issues

Antenatal prophylaxis

- Transfer mother to a regional center capable of managing a high-risk birth and newborn.
- Administer 2 doses of dexamethasone 12 hours apart to mother for prophylaxis of DRS
- Consider tocolysis until steroids
- The administration of antibiotics for the prophylaxis of neonatal infection

Key points when care a premature infant- postnatal



-Thermic protection

-Giving necessary calories

-Preventing and treatment of Hypoglycemia

Management – before and after birth

- If anticipate a birth of high risk, increase the temperature in the delivery room to 25-28 ° C, according to WHO recommendations
- Preheat the items before contacting the child.
- These include (not limited to) the mat, your hands stethoscope, radiological and diaper boxes
- Carefully apply the principles of "warm chain“
- Incubator preheating and proper equipment for intensive care in the delivery room
- Air (no O2) moistened (> 80%), heated (40ºC in children <800 g) in the incubator, high moisture level, walled
- Command set to 36,5ºC

Thermic protection

- Skin – to –skin contact
- Hold the premature newborn in direct contact with the mother's breast, covering his head with a cap and keeping dressed
- Place the premature newborn in polyethylene bag without drying, immediately at birth
- Use portable incubator equipped with oxygen and CPAP for transport to NICU
- Underlying thermal mattress, set between 35.0-36.0

Transfer from the delivery room to the intensive care unit:

New born weight	Incubator temperature			In ° C
	0 – 24 h	2 - 3 days	4 - 7 days	> 8 days
< 1500 g	35 – 36	35 – 36	34 – 35	34
1500 – 2000 g	34 – 35	34	34	34
2001 – 2500 g	34	33	33	33
>2500 g	33	32	32	32

- If the incubator has unique wall, increase the incubator temperature 1 ° C for every 7 ° C difference in temperature between the room and incubator.

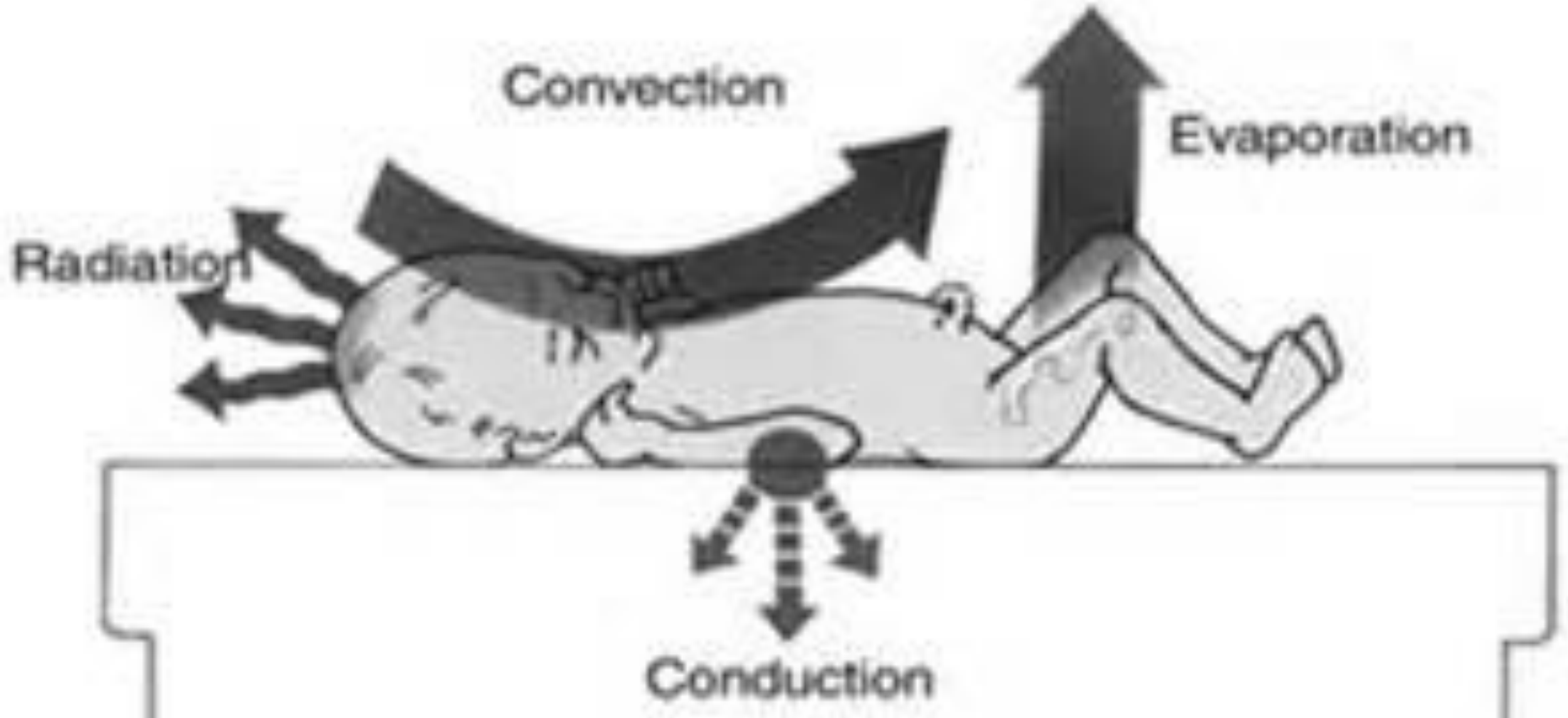
Nest method

- Rank quiet nest midline hand-stands head and shoulders forward, legs bent and brought to the midline Use a comfortable position
- It should be space for movement
  In case of transfer from the incubator using free swaddle

Kangaroo method

- It is applicable to all the infants stabilized weighing 1.5 to 2.5 kg, but especially recommended care for children with a weight of 1.5 to 1.8 kg.
- While the baby is recovering from an illness, the mother hold the baby in skin-to-skin contact for short periods of time (1-3 h/day). Baby condition must be stable, not require oxygen or IV fluid .
- Place the baby on the mother chest in an upright position directly against the mother skin under the mother clothes and cover with a pre-warmed blanket.
- If the baby is in continuous kangaroo mother care chek the baby temperature twice daily.

Ways of losing the warmness



Hypothermia and excessive heat loss

- Preterm infants are predisposed to heat loss because they have a high ratio of surface area to body weight
- Typical “frog” position limits their ability to reduce the skin area exposed to colder environment
- Muscular activity is reduced
- The adipose tissue, glycogen and brown fat are reduced
- The quantity of norepinephrine after cold stress is low
- Low energy consumption, necessary for thermogenesis.
- The frecvent lung diseases makes thermogenesis low, with high consumption of oxygen.
- The skin radiation and intensive vascularization increase thermolysis.
- All this are the result of often hypothermia at premature babies

Complications of hypothermia

- Hypoglycemia secondary to depletion of glycogen stores
- Metabolic acidosis caused by hypoxia and peripheral vasoconstriction
- Clotting disorders: DIC , pulmonary and intraventricular hemorrhage
- Shock- low BP, plasma volume and cardiac output
- Apnea
- Severe sinus bradycardia

Simptomes of hipothermia

- Feet are cold (before the rest of the body gets cold)
- Impossibility of nursing.
- Less movements, need of sleeping
- Low voice

Reheating method in incubator

- Determine the temperature for the incubator based on the baby`s weight and age, 1-1.5 ° C above the temperature in central, rectal.
- Warm the incubator to the desired temperature before placing the baby inside.
- Ensure that the baby`s head is covered and is clothed. It is necessary for the baby to be partially undressed for observation or a procedure.

Concepts that should guide assistance during reheating:

- Concept # 1. When reheating hypothermic babies skin temperature will be higher than rectal, so it is important to monitor rectal temperature to normalize after axillary temperature 36.0-36.5.
- Concept # 2. Reheating too quickly can also lead to clinical deterioration.
- Concept # 3. Reheating newborn can use either an incubator or a radiant warmer.

Reheat Guide

- - Closely monitored
  - Central temperature
  - The frequency and heart rate
  - Blood pressure
  - Respiratory rate and respiratory effort
  - Oxygen saturation
  - Glycemia
- Monitorize carefully - the frequency and heart rate
- Bradycardia is common if the baby is hypothermia;
- Heart rate should increase slowly during reheating
- If it becomes tachycardia - "may be a sign of low cardiac output!
- Attention arrhythmia

Food initiation Scheme

- Enteral feeding of small amounts of breast milk or premature formulas 0.5-1.0ml/h by bolus or continuous drip by gastric tube can promote gut development
- - 10 ml / kg / day on the first day for children weight <1000 g
  - 20 ml / kg / day - for children >1000g

- If the baby weighs 1.25 to 2.5 kg, feed the baby 8 times/day, starting on day 2, or later according to stable condition.
- If the baby weighs < 1.25kg, feed the baby 12 times/day, give expressed breast milk 3ml from 3-d day of life by gastric tube.

Kcal needs for a premature

- Day 1 – 3: 30 – 60 kcal/kg/day
- Days7 – 10 :70 – 80 kcal/kg/day
- Days10 – 14 : 100 – 120 kcal/kg/day
- 1 moth: 135 – 140 kcal/kg/day
- 2 month:
- if NW>1500 gr :130 – 135 kcal/kg/day
- dacă NW<1500 gr. : 140 kcal/kg/day
- 3 – 5 months: 130 kcal/kg/day

Fluids

- Administration of fluids. Start taking sol injection 10% glucose, which may be administered during the first ten days of life.
- Solutions containing glucose can cause tissue necrosis and should be allowed to leak into subcutaneous tissue.
- After stabilizing the child over 2-3 hours install central catheter (under sterile conditions)
- Initial infusion of 70 ml / kg / day, in premature infants <1000 g to 90 ml / kg / day
- Assess hydration, urine output and weight the baby daily.

Common tests performed on a premature infant

- Blood gas analysis to check oxygen levels in the blood
- Blood tests to check glucose, calcium, and bilirubin levels
- Blood test with white blood components and report differentiation of immature / total
- Blood culture
- Chest and abdominal x-ray if necessary
- Continuous cardiorespiratory monitoring (monitoring of breathing and heart rate)

Routine monitoring include:

- - Measure the perimeter of head / waist every 24 hours in neonates with birth weight ≤1000 g
  - Measure waist circumference every 4-8 hours;
  - Auscultation abdomen every 4 hours
  - Measure tºC every 2-4 hours
  - Making stool occult blood test (not meconium) in neonates with birth weight ≤1500 g
  - The weighing every 12 hours for children weighing ≤1000 g, while that of ≤750 g - every 8 hours
  - Eye exam 4 weeks in neonates with birth weight ≤1500 g

Electrolyte balance

- The first day should not be given Na + and K +
  On the fourth day of life, if urine output is stabilized, give glucose solution of 10% with 3 mmol / kg body weight of sodium and 2 mmol / kg body weight of potassium

- To prevent hypocalcemia start gluconate administration as 200 mg / kg / day

- Monitor blood electrolytes

Appreciate daily hydration:

- If there are signs of dehydration (such as sunken eyes or fontanelle, skin turgor decrease or dry tongue and mucous membranes), increase the amount of fluid infused with 10% of body weight newborn in first day it was observed dehydration;

- If there are signs of over hydration (adding excessive weight, eye edema, or swelling of the lateral parts of the body progression), reduce the volume by half the solution for 24 hours after the over hydration is noted.

Monitoring the level of glucose

- Blood glucose should be kept between 2.8 to 6.0 mmol / l (see protocol newborn hypoglycemia).
- Some children may become hyperglycemic, change to a 5% glucose solution. Check blood glucose again in three hours.
- Insulin is used rarely because it is the danger of sudden hypoglycemia and need frequent blood glucose monitoring.

Monitoring (continue)

- **Record when the child urinates** (weighing diapers, diaper, urine collector). Normal diuresis 1-4 ml / kg / hr (75-300 mOsm / l).

  Measure the child's weight daily

  -Children aged up to 32 GW weight <1500 g in weight should not lose --more than 5% of the weight at birth.

  -Premature babies should reach mass birth not later than 14-15 days, the time to a7-10 day

  -This will ensure the advancement of food account with 20 ml / kg / day and higher volume infusion 20 ml / kg / day observing the correlation kcal non-protein and protein (the non-protein must duplicate the protein)

  -If you decrease the child's weight exceeds 5% Add 10-25 ml infusion for a day to compensate for inadequate fluid administration

  -Newborns weighing <1000 g will have weighed every 12 hours, while the smallest 750 g - every 8 hours

  -In case of intensive phototherapy lamps to infusions two 20 ml / kg / day

Monitoring (continue)

- Correction of anemia.
  All children and many of GFMN GEMN requires at least one red blood cell transfusion. Supplementary iron premature baby needs during the first year of life.

- - It is given Vitamin E (also decreases the incidence of retinopathy), folic acid in the 3rd week of life.
  - Correction hypotension (keep blood pressure (BP) average> in weeks gestation). TA is calculated by the average systolic + diastolic blood pressure / 2
  - If the child is hypotensive for optimizing the initial TA correction is carried out with volume 10 ml / kg 20-30 minutes by administering:
    - 0.9% saline may be repeated once, then switch to amines;
    - Albumin 5% (if you have ground. 25% using 2-4 ml / kg, diluting it with 0.9% NaCl to 20 ml / kg);
    - fresh blood if the child is anemic.
    - inotropic infusion was administered later (Dopamine Hydrochloride).

Infection prophylaxis

- Passage of gamma globulins by placenta occurs at 32 weeks of gestation and infants are highly susceptible to infection.
- Assess the child for infection, clinical and laboratory tests.

- Some useful tests are:
  a) complete blood count
  b) C-reactive protein after 12 hours of life (N<6mg/ml)
  c) ANC in the first 3 days of life (N=7800-12600)
- d) the ratio of immature / total neutrophils (N< 0,2)

Supplements

- At birth:

  - vitamin K if birth weight ≥800 g - 1 mg IM; <800 g - 0.5-1 mg IV slowly
- - vitamin A 5,000 IU / m X 3 times / week
  - day 8 of life if the volume of enteral nutrition is about 2 ml / hour and the baby is not added to parenteral nutrition folic acid 0.5 ml 0.1 mg
  - at 30 days of life elementary iron (Fe) is added 2-3 mg / kg / day during 3-4 months

A premature baby can be discharge when:

- Weight 1800-2000g or even at 1500g if the following conditions are respect:
- Good health conditions
- At least last days baby adds s
- Thermogenesis is better
- Normal nursing
- Mother’s ability to take gooc

Selected References

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